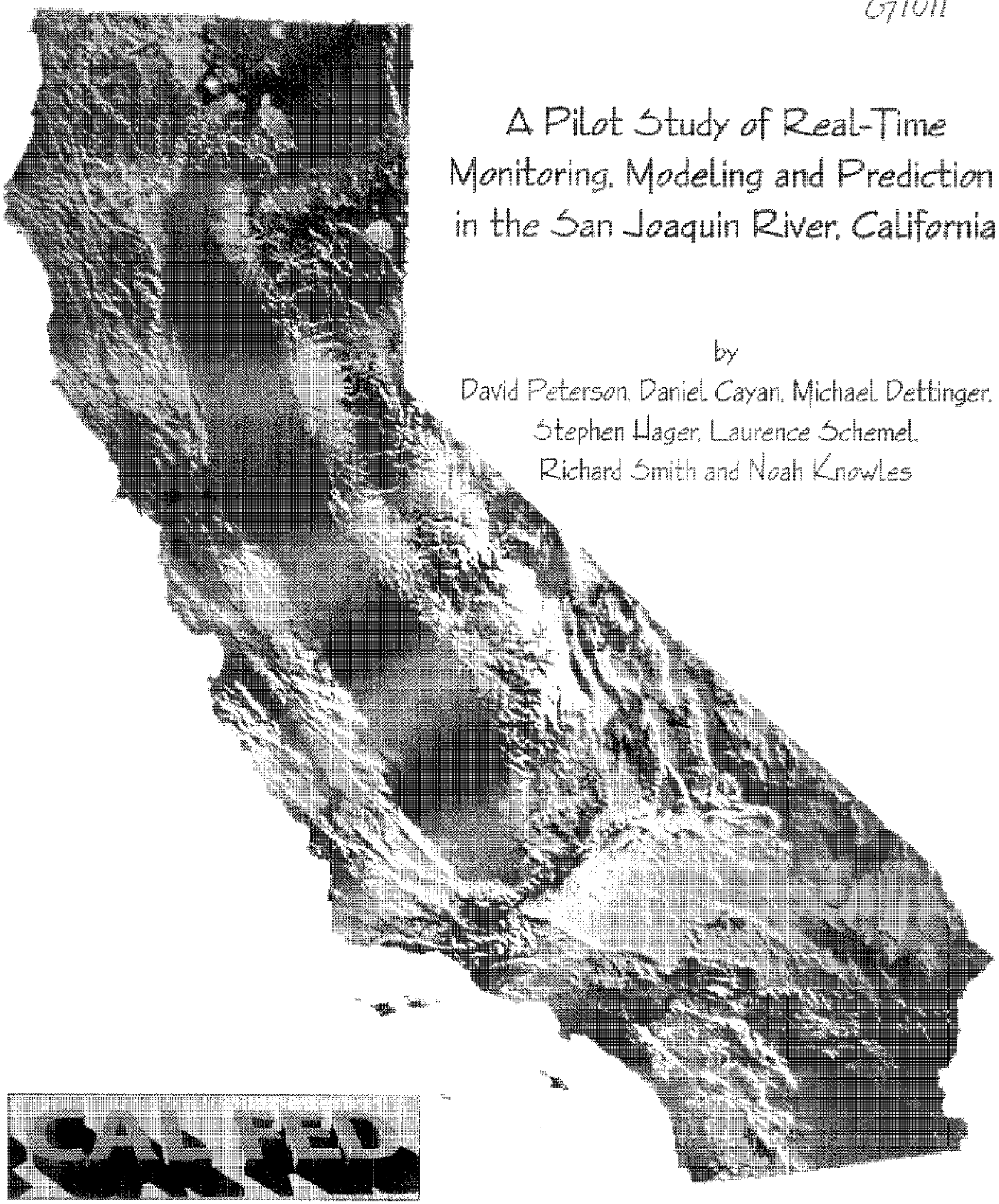

A Pilot Study of Real-Time Monitoring, Modeling and Prediction in the San Joaquin River, California

by

David Peterson, Daniel Cayan, Michael Dettinger, Stephen Hager, Laurence Schemel, Richard Smith and Noah Knowles

G1011

Attachment H

COVER SHEET (PAGE 1 of 2)

May 1998 CALFED ECOSYSTEM RESTORATION PROPOSAL SOLICITATION

Proposal Title: A Pilot Study of Real-Time Monitoring, Modeling and Prediction, San Joaquin River, CA

Applicant Name: David H. Peterson and others (see text)

Mailing Address: USGS, MS 946, 345 Middlefield Road, Menlo Park, CA 94025

Telephone: 650-329-4525

Fax: 650-329-4327

Amount of funding requested: $455,250 for 3 years

Indicate the Topic for which you are applying (check only one box). Note that this is an important decision: see page __ of the Proposal Solicitation Package for more information.

- ☐ Fish Passage Assessment
- ☐ Fish Passage Improvements
- ☐ Floodplain and Habitat Restoration
- ☐ Gravel Restoration
- ☐ Fish Harvest
- ☐ Species Life History Studies
- ☒ Watershed Planning/Implementation
- ☐ Education
- ☐ Fish Screen Evaluations - Alternatives and Biological Priorities

Indicate the geographic area of your proposal (check only one box):

- ☐ Sacramento River Mainstem
- ☐ Sacramento Tributary: _____
- ☐ Delta
- ☐ East Side Delta Tributary: _____
- ☐ Suisun Marsh and Bay
- ☐ San Joaquin Tributary: _____
- ☒ San Joaquin River Mainstem
- ☐ Other: _____
- ☐ Landscape (entire Bay-Delta watershed)
- ☐ North Bay: _____

Indicate the primary species which the proposal addresses (check no more than two boxes):

- ☒ San Joaquin and East-side Delta tributaries fall-run chinook salmon
- ☐ Winter-run chinook salmon
- ☐ Spring-run chinook salmon
- ☐ Late-fall run chinook salmon
- ☐ Fall-run chinook salmon
- ☐ Delta smelt
- ☐ Longfin smelt
- ☐ Splittail
- ☐ Steelhead trout
- ☐ Green sturgeon
- ☐ Striped bass
- ☐ Migratory birds

COVER SHEET (PAGE 2 of 2)

May 1998 CALFED ECOSYSTEM RESTORATION PROPOSAL SOLICITATION

Indicate the type of applicant (check only one box):

☐	State agency	☒	Federal agency
☐	Public/Non-profit joint venture	☐	Non-profit
☐	Local government/district	☐	Private party
☐	University	☐	Other: _____

Indicate the type of project (check only one box):

☐	Planning	☐	Implementation
☒	Monitoring	☐	Education
☐	Research		

By signing below, the applicant declares the following:

(1) the truthfulness of all representations in their proposal;

(2) the individual signing the form is entitled to submit the application on behalf of the applicant (if applicant is an entity or organization); and

(3) the person submitting the application has read and understood the conflict of interest and confidentiality discussion in the PSP (Section II.K) and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

David H. Peterson

(Signature of Applicant)

II. Executive Summary

a. Project Title and Applicant Name – A Pilot Study of Real-time Monitoring, Modeling and Prediction, San Joaquin River, CA. By David H. Peterson and others (see text).

b. Project Description and Primary Biological/Ecological Objectives – Nitrate is a fundamental parameter of watershed ecosystems. As an integrator of upstream ecosystem activities, we will use in situ instrumentation to monitor (San Joaquin River, Vernalis) the concentration of dissolved inorganic nitrate in real time. The data, including specific conductivity and water temperature will be available on the Internet. Variability will be interpreted in the context of known climate and human factors and statistical-dynamical forecasts will be made for strong "signals." This will provide a state-of-the-art downstream monitor of the "metabolic health" of an exceedingly complex and human altered watershed.

c. Approach/Tasks/Schedule – A state of art insitu nitrate analyzer (colorometric) will be installed in the San Joaquin River, Vernalis. The dissolved inorganic nitrate concentrations will be available on the Internet along with water temperature, specific conductivity, and discharge. Statistical-dynamical models will be used to simulate the variations in nitrate concentrations including forecast concentrations. Results will be interpreted in the context of climate and human-caused variability. The first two years will be used in instrument installation/calibration/data transmission and testing. The third year will be to complete a routine protocol with the USGS California District, complete Internet hardware/software and develop and interpret the time series characteristics in a climate and human activity context.

d. Justification for Project and Funding by CALFED – Managers need data in a timely fashion. The nitrate monitor will provide an integrated signature of the ecosystem "successes and failures." It will also provide a quantitative framework based on a key ecosystem parameter (ie., in general watersheds with high concentrations and rates of nitrate leakage are not at optimum health). There is no way all of the relevant, ecosystem process and rates can be determined in a complex watershed such as the San Joaquin Basin. Monitoring biologically important parameters, such as nitrate is a realistic option.

III. Title Page

a. Title of Project – A Pilot Study of Real-time Monitoring, Modeling and Prediction, San Joaquin River, CA.

b. Name of applicant/principal investigator(s); address; phone/fax/e-mail; organizational, institutional or corporate affiliation of applicant/principal investigator(s). Note: the latter information is given in the address

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I-010873

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e-mail: mddettin@usgs.gov

c. Type of Organization and Tax Status – Federal agency – nontaxable

d. Tax Identification Number and/or Contractor license, as applicable-not applicable

e. Participants/Collaborators in Implementation – D. Peterson, D. Cayan, M. Dettinger, N. Knowles, S. Hager, L. Schemel, and R. Smith. Also, the USGS California District.

IV. Project Description

a. Project Description and Approach – This project will take advantage of the long-term observations of the San Joaquin Basin at Vernalis. A state-of-the-art insitu dissolved inorganic nitrate analyzer will be installed and the data, including discharge, water temperature and specific conductivity will be sent in real-time to a web site on the Internet. Most biologically reactive substances are undersampled in time and space. To the best of our knowledge this will be the only such parameter sampled with high resolution.

b. Proposal Scope of Work – The monitoring site essentially encompasses the entire San Joaquin watershed. Our focus is on real time dissolved inorganic nitrate concentrations and to develop statistical dynamical models of Nitrate variability and provide the results on the Internet.

See budget regarding necessary funding, the nitrate analyzer will be a one-time purchase at the start of the project.

c. Location and/or Geographic Boundaries of the Project – The monitor site, San Joaquin River, Vernalis is essentially downstream of the entire San Joaquin Basin.

d. Expected Benefit(s)- This fits: 2. Seasonal wetland and aquatic as per CALFED, 1998, Attachment B, p. 67, for the San Joaquin watershed, Expected benefits as per CALFED, 1998, Attachment C p. 75-77 includes: 4. Water Quality, increased salinity, increased nutrient or carbon input and 5. Water temperature (i.e., it is downstream of the New Melones Reservoir used to regulate salinity, and in the future water temperature, in the San Joaquin River.

e. Background and Ecological/Biological/Technical Justification

Introduction

The Sacramento/San Joaquin Basin is the largest and most important watershed in California, serving many needs, most of which are centered around water issues. Water managers dealing with this system do not work in a vacuum. They need to know how the system has changed, its present state and how it might change in the future.

How the system has changed will never be completely known because there are not adequate records of the "initial" state. However, we do know that for millions of years, before European settlement, only natural forces managed the river basins and fisheries flourished while facing glacial, interglacial, flood, drought, forest fire, etc. regimes and episodes. With increasing European settlement, fisheries populations declined, although some species are maintained by fish hatcheries and new introduced species have emerged. Much of this decline has been due to loss of habitat, and therefore, CALFED (1998) is funding efforts to restore and monitor individual river basins flowing to San Francisco Bay estuary/Delta.

The Sacramento and San Joaquin Basin

Our contribution towards such CALFED efforts is to focus on the San Joaquin Basin, one of the most altered river basins by human activity in the United States. In terms of river chemistry the Sacramento Basin appears less altered largely because it is in a more humid region (more dilution). This distinction is a broad spatial reflection that climate is the major source of variability in the water resources of the entire region (Fig. 1) both spatially and temporally. For example, in dry years some characteristics of the Sacramento (i.e., total dissolved solids concentrations) are driven in a direction to be more San Joaquin River-like; whereas in wet years some characteristics of the San Joaquin are driven in a direction to be more Sacramento River-like. In essence much of the upstream behavior of these rivers, including downstream management decisions, are linked to atmospheric forcing (precipitation and air temperature). Of course there is much overlap in their annual hydrographs but there are also differences. The natural peak flows in the Sacramento Basin are more winter rainfall than spring snowmelt driven (lower elevation basins, c.f. Fig. 2). The San Joaquin, however, has a relatively larger natural snowmelt peak (higher elevation

basins, c.f. Fig. 2). Thus, the two major basins differ in both amount and timing of peak flows (seasonal hydrograph) and in the effects of human (largely agricultural) activity on their flows and chemistry.

The San Joaquin Basin

In the San Joaquin Basin, over the decades, especially since World War II, the spring peak discharge has faded as measured against the Merced River, Happy Isles, Yosemite National Park (Fig. 3). Although the Merced River at Happy Isles is only about 10 percent of the San Joaquin discharge at Vernalis, it's a useful index of basin-wide snowmelt because spring snowmelt is a large-scale phenomenon (Cayan and others, 1997). That is, the same or similar snowmelt variations also appear in the other major tributaries feeding the San Joaquin River as they do in the Merced.

As a result of the spring water loss, largely to storage and subsequent irrigation, agricultural soil salinization has increased, which is typical of arid and semiarid regions (e.g. Fig. 4). Soil salinization is also reflected in the long-term rise in San Joaquin River salinity or total dissolved solids since the pre-World War II era (Fig. 5), as well as other chemicals such as dissolved inorganic nitrate (Nichols and others, 1986).

The ERPP objectives herein are addressed in CALFED 1998, G. Local Watershed stewardship p. 55-57.

f. Monitoring and Data Evaluation – We target monitoring data to be on line after the first two years and results will be evaluated in the third year. Observations models and analyses will be available on the Internet. Results will be presented at appropriate meetings and published in reports and scientific journals.

g. Implementation – we consider this to be relatively straightforward (not an issue) in the context inferred by the many questions (CALFED, 1998, pages 17 and 18). Our efforts are largely coordinated in-house along with the USGS, California District and to a lesser extent other agencies.

I-010876

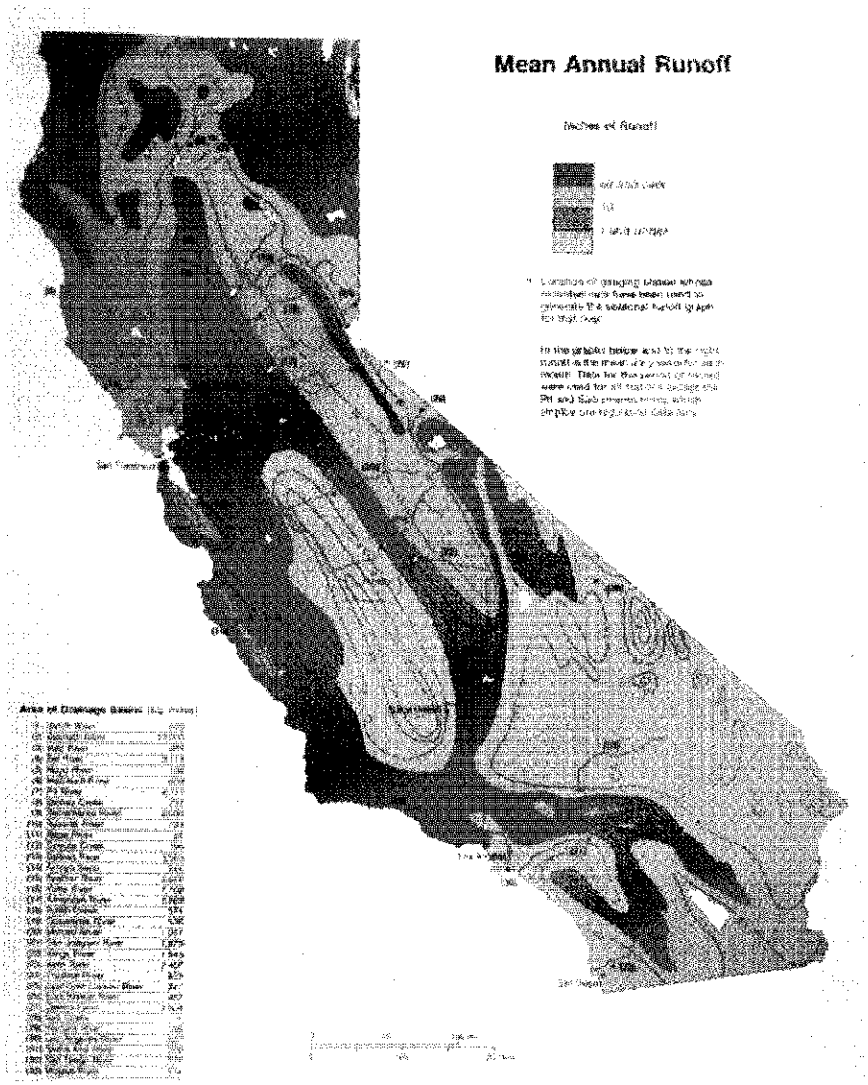

Figure 1: Mean Annual Runoff for California (adapted from Kahrl, 1978).

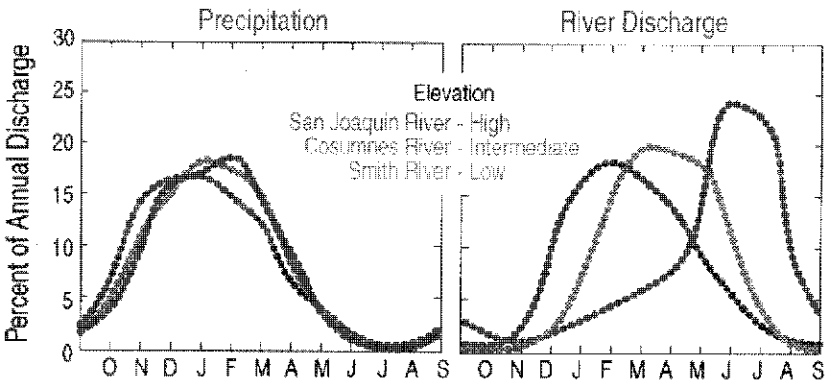

Figure 2: Influence of elevation on the annual discharge pattern (adapted from Cayan and Riddle, 1992).

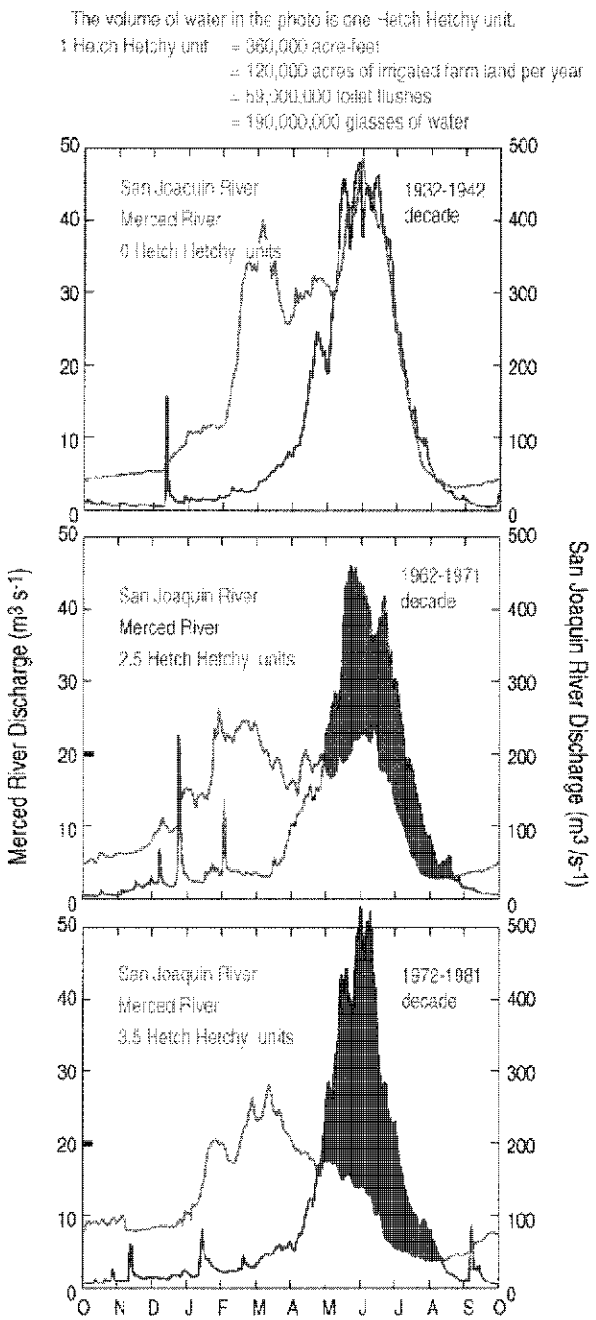

Figure 3: The effect of water management on spring discharge, San Joaquin River, Veranlis.

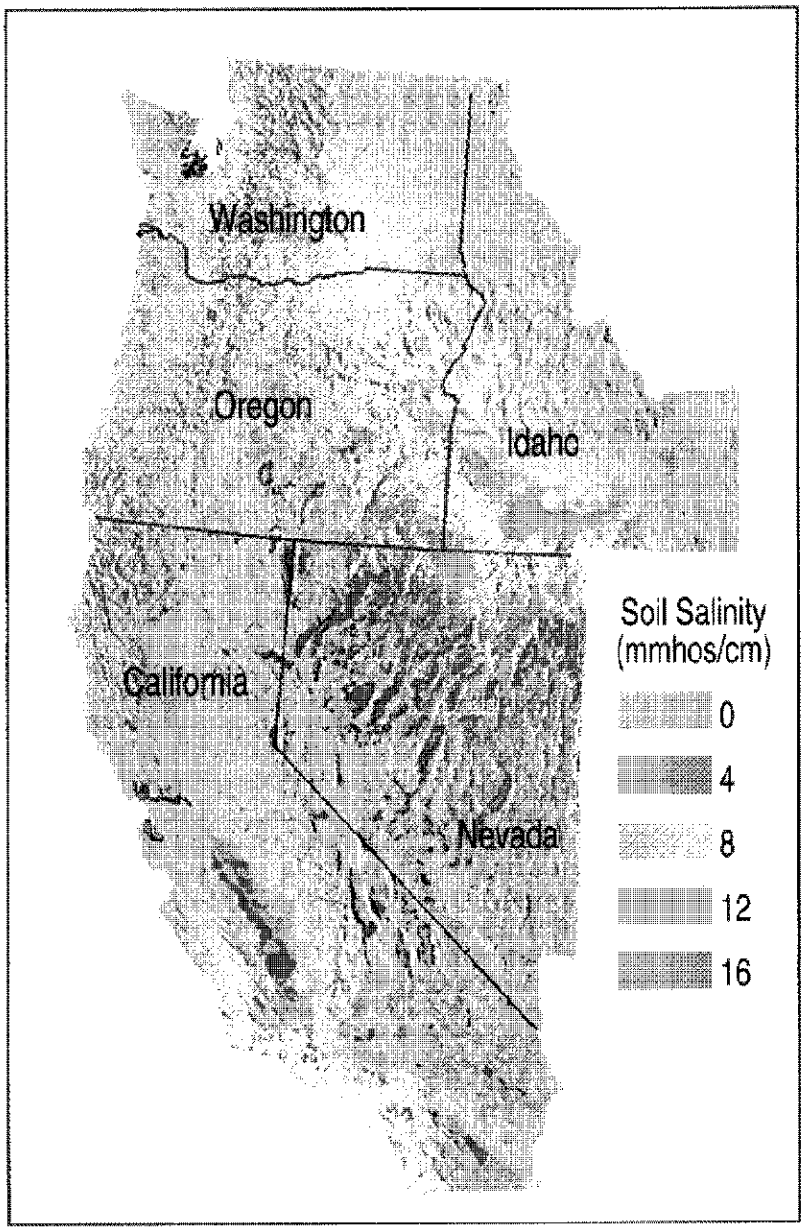

Figure 4: Climate and water management influence on Soil Salinities.

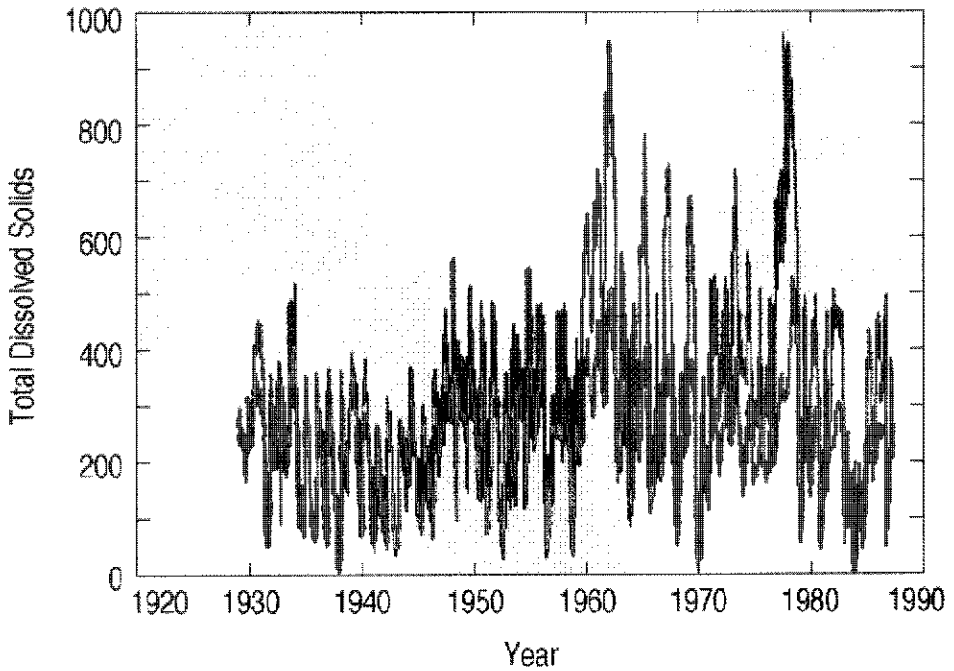

Figure 5: Long term record of San Joaquin total dissolved solids (TDS). Red is observed mean-monthly concentration,; green is simulated assuming the 1920-30's discharge - TDS relationship is constant throughout the length of record.

V. Costs and Schedule to Implement Proposed Project

a. Budget Costs

SALARIES

D. Peterson, Oceanographer, USGS	no charge
D. Cayan, Director Climate Research Division SIO and Oceanographer, USGS	no charge
M. Dettinger (one month), Hydroclimatologist, USGS	$17,000/yr for 3 years
N. Knowles, Ph.D. student SIO	no charge
S. Hager, Hydrologist, USGS (three months)	$20,000/yr for 3 years
L. Schemel, Hydrologist, USGS	no charge
R. Smith (three months) Hydrologist/Computer Specialist	$30,000/yr for 3 years
Data Assistant	$15,000/yr for 3 years

TRAVEL

Largely between offices and Vernalis and meetings with District Personnel in Sacramento	$1,000/yr for 3 years

EQUIPMENT

Insitu nitrate analyzer (training costs $5,000 but will be paid by USGS)	$25,000
Data transmission equipment and setup	$10,000
Annual maintenance	$7,500/yr for 3 years
Overhead (50% of NET)	$50,583/yr for 3 years
Three year total	$455,250

b. Schedule Milestones – The first two years will be for instrumentation setup, testing and calibration, and development of the data transmission scheme. The third year will be for implementation on the Internet.

c. Third Party Impacts – probably not relevant.

VI. Applicant Qualifications

See budget for a listing of job titles. The investigators have considerable experience in plant nutrient chemistry and hydroclimatology. Examples of recent work are shown in references below.

I-010882

References

CALFED, 1998, Proposal Solicitation Package, Ecosystem Restoration Projects and Programs, 98p.

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Cheng, R.T., Casulli, V., and Gartner, J.W., 1993, Tidal, residual, intertidal mudflat (TRIM) model and its applications to San Francisco Bay, California: Estuarine, Coastal, and Shelf Science, v. 36, p. 235-280.

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Dettinger, M.D. and Cayan, D.R., 1995: Large-Scale atmospheric forcing of recent trends toward early snowmelt runoff in California, J. of Climate, 8: 606-623.

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Peterson, D.H., Cayan, D.R., Dettinger, M.D., and Smith R.E., 1997, Relation on air temperature and winter snowpack to spring snowmelt-driven river discharge, Yosemite National Park: Eos, AGU Spring 1996 Meeting supplement, v. 78, p. S148.

Peterson, D.H., Dettinger, M.D., Cayan, D.R., Smith, R., Riddle, L., and Knowles, N., 1997, What a difference a day makes: Spring snowmelt in the Sierra Nevada: Interagency Ecosystem Program for the Sacramento-San Joaquin Estuary Newsletter, Summer 1997, 16-19.

Schemel, L.E., 1997, Simulations and observations of salinity in South San Francisco Bay, CA., 1995: Effects of freshwater discharge, tides, and winds, ASLO, 1997, Santa Fe, New Mexico February, 1997 p. 296

Other relevant activities/connections include – we are working towards installing a similar system at upstream Yosemite National Park, Merced River. This would provide a baseline for the valley floor.

VIII. Compliance with standard terms and conditions –

see attached form DI-2010.

I-010885

U.S. Department of the Interior

Certifications Regarding Debarment, Suspension and Other Responsibility Matters, Drug-Free Workplace Requirements and Lobbying

Persons signing this form should refer to the regulations referenced below for complete instructions:

Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions - The prospective primary participant further agrees by submitting this proposal that it will include the clause titled, "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions. See below for language to be used or use this form for certification and sign. (See Appendix A of Subpart D of 43 CFR Part 12.)

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions - (See Appendix B of Subpart D of 43 CFR Part 12.)

Certification Regarding Drug-Free Workplace Requirements - Alternate I. (Grantees Other Than Individuals) and Alternate II. (Grantees Who are Individuals) - (See Appendix C of Subpart D of 43 CFR Part 12)

Signature on this form provides for compliance with certification requirements under 43 CFR Parts 12 and 18. The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of the Interior determines to award the covered transaction, grant, cooperative agreement or loan.

PART A: Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions

CHECK__IF THIS CERTIFICATION IS FOR A PRIMARY COVERED TRANSACTION AND IS APPLICABLE.

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

PART B: Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions

CHECK__IF THIS CERTIFICATION IS FOR A LOWER TIER COVERED TRANSACTION AND IS APPLICABLE.

(1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

DI-2010
June 1995
(This form replaces DI-1953, DI-1954, DI-1955, DI-1956 and DI-1957)

PART C: Certification Regarding Drug-Free Workplace Requirements

CHECK__IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS NOT AN INDIVIDUAL.

Alternate I. (Grantees Other Than Individuals)

A. The grantee certifies that it will or continue to provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an ongoing drug-free awareness program to inform employees about--
(1) The dangers of drug abuse in the workplace;
(2) The grantee's policy of maintaining a drug-free workplace;
(3) Any available drug counseling, rehabilitation, and employee assistance programs; and
(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will --
(1) Abide by the terms of the statement; and
(2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

(e) Notifying the agency in writing, within ten calendar days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification numbers(s) of each affected grant;

(f) Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph (d)(2), with respect to any employee who is so convicted --
(1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or
(2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a) (b), (c), (d), (e) and (f).

B. The grantee may insert in the space provided below the site(s for the performance of work done in connection with the specific grant:

Place of Performance (Street address, city, county, state, zip code)

345 Middlefield Road, Menlo Park, San Mateo, CA 94025
9500 Gilman Drive, La Jolla, San Diego, San Diego, CA 92093

Check__if there are workplaces on file that are not identified here.

PART D: Certification Regarding Drug-Free Workplace Requirements

CHECK__IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS AN INDIVIDUAL.

Alternate II. (Grantees Who Are Individuals)

(a) The grantee certifies that, as a condition of the grant, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in conducting any activity with the grant;

(b) If convicted of a criminal drug offense resulting from a violation occurring during the conduct of any grant activity, he or she will report the conviction, in writing, within 10 calendar days of the conviction, to the grant officer or other designee, unless the Federal agency designates a central point for the receipt of such notices. When notice is made to such a central point, it shall include the identification number(s) of each affected grant.

DI-2010
June 1995
(This form replaces DI-1953, DI-1954, DI-1956, DI-1956 and DI-1963)

PART E: Certification Regarding Lobbying
Certification for Contracts, Grants, Loans, and Cooperative Agreements

CHECK__ IF CERTIFICATION IS FOR THE AWARD OF ANY OF THE FOLLOWING AND THE AMOUNT EXCEEDS $100,000: A FEDERAL GRANT OR COOPERATIVE AGREEMENT; SUBCONTRACT, OR SUBGRANT UNDER THE GRANT OR COOPERATIVE AGREEMENT.

CHECK__ IF CERTIFICATION IS FOR THE AWARD OF A FEDERAL LOAN EXCEEDING THE AMOUNT OF $150,000, OR A SUBGRANT OR SUBCONTRACT EXCEEDING $100,000, UNDER THE LOAN.

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

As the authorized certifying official, I hereby certify that the above specified certifications are true.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL

Steve Ingebrtisen

Steven E. Ingebrtisen, Chief, Branch of Regional Research, WRD, WR

TYPED NAME AND TITLE

June 29, 1998

DATE

DI-2010
June 1988
(This form replaces DI-1953, DI-1954, DI-1955, DI-1956 and DI-1963)